

Demand and Consumption Pattern Analysis of commercial drinking water among selected barangays of Tabuk City

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Abstract— *The study analyzed the demand and consumption pattern of commercial drinking water in 4 barangays of Tabuk city namely; Dagupan, Dagupan Centro, Bulanao, and Bulanao Norte from April 2018 to August 2018.*

Five hundred thirty seven (537) households and fifty (50) from the business sector were the respondents. Qualitative and Quantitative data were gathered from the respondents through the use of structured questionnaire. Descriptive statistics and inferential statistical tool specifically Pearson-Product-Moment Correlation is the tool in determining the significant correlation between demand and consumption pattern of commercial drinking water and the motivational factors affecting consumption was used. . It was found out that majority of the household respondents consumed commercial drinking water anytime after food intake that includes meals and snacks either at home or at work and frequency of use was based on weather conditions; this pattern accounts for a high demand of commercial drinking water. Advertisement was the major source of information about commercial drinking water followed by parent's friends and environmental science seminars.

Commercial drinking water operators and suppliers employed marketing strategies and production strategies. Arranged delivery schedule, market information, local penetration and media advertisement which is described as relationship marketing or transactional marketing. The operators further noted training of workers, transparent production and quality control in the production process.

Keywords— *Demand, Consumption pattern, commercial drinking water, Tabuk City.*

I. INTRODUCTION

Water has always been an important and life sustaining drink to humans and is essential to the survival of most other organisms. Excluding fat, water composes approximately 70% of the human body mass. It is a crucial component of metabolic processes and serve as a solvent for many bodily solutes that is why bottled water is sold for public consumption in most habituated parts of the world (USEPA, 2006).

Rauf, S. (2015) reported that water and sources are critical factor of sustainable development so it is a concern of policy makers because the gradual increase of population has a corresponding increase of demand ,

increases water scarcity hence pricing policy is the concern of policymakers.

Water is an indispensable input for industrial production and human existence. Currently, people concerned about their health, and their interest in the safety of drinking water have increased. Some people prefer purchasing bottled water and using water-treatment equipment to drinking tap water. These actions can be interpreted as preventive behavior against the decline in tap water quality. Since such behavior entails defensive expenses and deteriorates the level of welfare by diminishing real income, the government attempts to provide a policy to improve the quality of tap water (So-

Yoon Kwak 1, Seung-Hoon Yoo 2, and Chang-Seob Kim 3, 2013).

The Philippine National Standards for Drinking Water (2017) is the result of a DOH directive (Administrative Order No. 2017-0010) seeking to update the existing standards of drinking water. Its objective is to address a number of new health issues and concerns that have emerged since the last update a decade ago contained in the handbook are experiences of water service providers, the new scope and definition from the Sustainable Development Goal (SDG) about water supply indicators, need for water quality standards during emergency, and newly-crafted guidelines by the World Health Organization (2011) on the safety of drinking water.

In a competitive economy market; penetration of basic goods that sustain life like bottled drinking water or commercial drinking water increasing in Tabuk City in spite of the presence of Tabuk Water Services that provided tap water level 3 service connection.

In Kalinga, the LGU's potable water sources is one of the priorities through the development of water facilities infrastructure. The gradual progress of a semi-urban municipality like Tabuk City has a gradual increasing rate of population that needs potable water. The use of water, food consumption pattern and hygiene behaviors shall be taken into account to reduce the consequences of health. Local water sources are present from dug wells, spring water, and private operated submersible pumps and public tube wells. According to the UNICEF report (2009); while progress has been made in terms of sanitation and water services, numerous issues still exist like the amount of water available household and the quality of this water, is a major issue. Hence, this study determined the available water facilities and the consumption pattern of households in terms of sale drinking water.

Water is inevitable in sustaining the life stamina of man and animals. Potable water consumption analysis is vital to find out the sources and practices of the households of the highly populated barangays of Tabuk City Kalinga. Healthy living is accounted by the safe water that is consumed by the people. Individuals are at risk especially children who experience diseases that is related to water and sanitation practices.

Tabuk City is the capital of Kalinga province in the northern part of the Philippines, 5th class city and formally established as City under RA 9404, February 15,

2011. According to a census made in 2015, it has a population of 110, 642 people out of 42 Barangays. The population of Tabuk City is a mixture of different Kalinga cultures and languages. The two barangays of Bulanao and Dagupan are the centers of commerce and trade for Tabuk City, and the focus of economic activity for most areas of Kalinga. Merchants from Ilocos, Pangasinan, Cagayan and other nearby provinces go to Bulanao and Dagupan to purchase rice, which is the major agricultural product of Kalinga. These merchants sell other commodities, especially seafoods, clothing, fabric, metal and plastic manufactured products and commercial drinking water. The language in the area is predominantly Ilocano (Tabuk City Files, 2015).

For a decade, the source of potable water of the households of Tabuk City are deep wells, tap water from pumping station, commercial drinking water (bottled water and refilling station). Based on the reports of DOH CAR (2017), that Kalinga has high incidence of diarrhea and typhoid fever which are both water-related diseases. As of June 30, 2011, Tabuk Water served 8 out of 42 barangay with 2,809 to 532 households. There was a 16.25 % increase (TAWA Report, 2017) and it was found out to be safe because latest bacteriological and chemical/physical examination was conducted by Cagayan Valley Medical Center. It indicates that all of the water supplied by Calapan Waterworks to its clients in Tabuk City conform to the Philippine National Standards for Drinking Water (PNSDW, 2017).

As embodied in Clean Water Act No. 9275 of 2004, which is a Law on Comprehensive Water Quality management (CWQM) that abate and control of pollution from land-based sources implemented by DENR under Administrative order No. 2005-10 (Aquino, A. & Bellisa, 2004) and supported by the latest Philippine National Standard of Drinking Water of 2017 (PNSDW) implemented by Department of Health (DOH) under Administrative Order no. 10 s.2017 which prescribes the standards and procedures of drinking water quality to protect public health and consumers.

Kalinga has a reported incidence of waterborne diseases such as diarrhea at 14 % and typhoid fever at 17% increase particularly in Bulanao (DOH CAR, 2016). Quarterly monitoring of drinking water facilities were undertaken by the Office of the Provincial sanitary Engineer and registered a total of 35 refilling stations in Tabuk City as of November 2018.

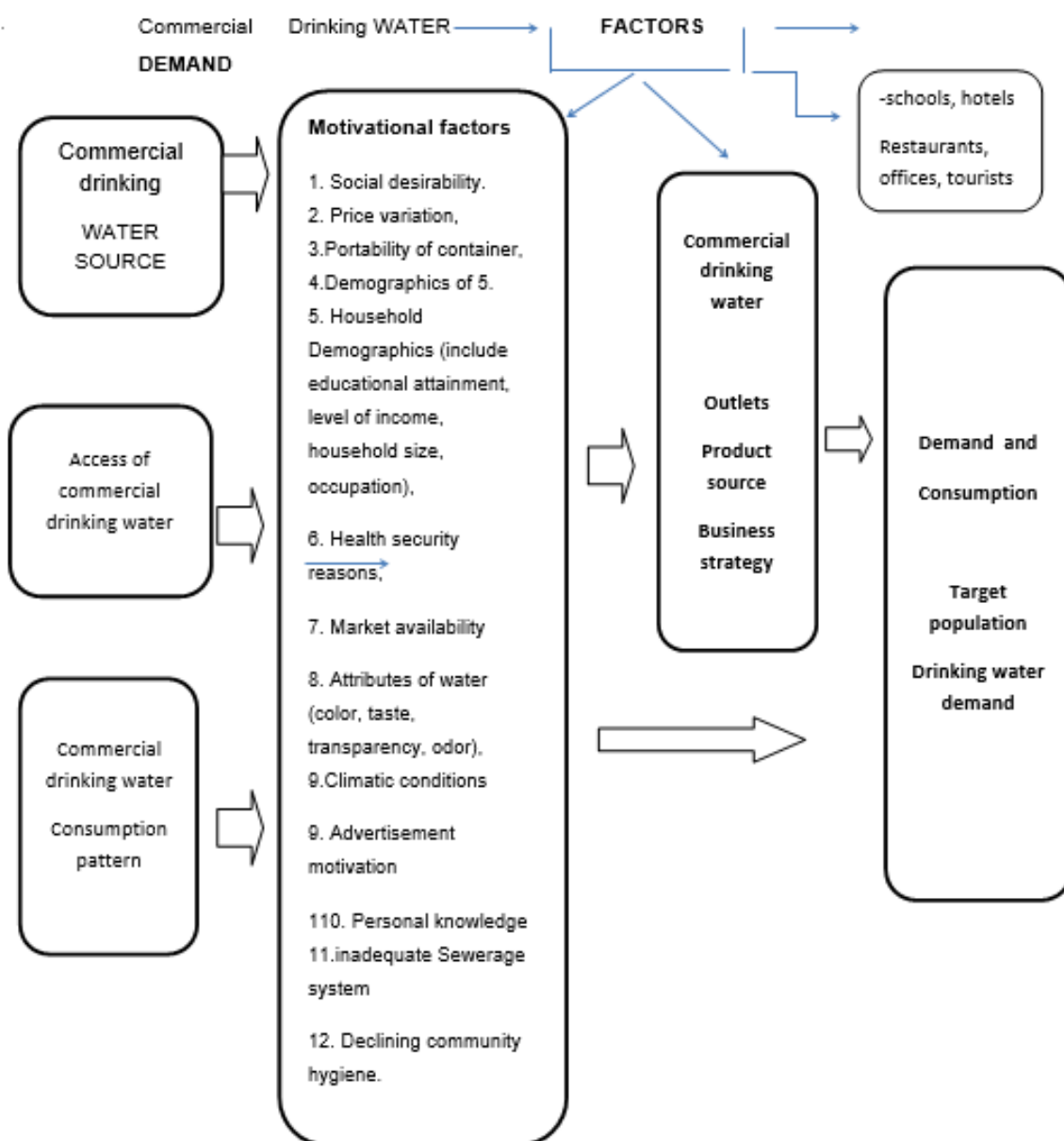


Fig.1: Analytical Framework of the study

Based on the foregoing literature, business prospect on commercial drinking water in Tabuk city could be a lucrative business. This study was conducted them to find out the motivational factors that affected the demand and consumption pattern of households.

The study specifically (1) determine the socio-economic profile of the respondents in the area; (2) find out the demand and consumption pattern of commercial drinking water; (3) find out the source and storage practices of drinking water of the respondents; (3) determine the motivational factors associated with demand and consumption of commercial drinking water; (4) find out the

relationship between demand and consumption pattern and motivational factors affecting consumption of commercial drinking water; (5) determine the business strategies employed by the commercial drinking water operators; and (6) the sources of information of the environmental issues associated with commercial drinking water.

II. METHODOLOGY

After making a preliminary documentary analysis of the data of Tabuk City it was found to that the target barangays particularly Bulanao and Dagupan has the greatest number of household with a high number of refilling stations and

many market outlets of bottled drinking water. As the core barangays of Tabuk city it has a population of 5,372 households found to have full service connections of the Tabuk water works .which is commercially operated. The 4 Barangays has 26 refilling stations operating sporadically; 16 refilling stations at Bulanao with 2,886 households, 3 refilling stations at Bulanao Norte with 1,035 households, 4 refilling stations at Dagupan Weste of 902 household while only 3 at Dagupan Centro with 569 household.

The study employed a descriptive design. Both the qualitative and quantitative research methods were used to extract data from the respondents.

Respondents of the study were household heads drawn of the 4 Barangays. A total of 537 were randomly selected using Gay (1976) selection method of respondents in large population while 26 refilling stations operators and 24 outlets of commercial drinking water were included as respondents to represent the business sector distributed

Instrumentation

Based on the objectives of the study, structured questionnaire was the main data gathering instrument. Both open and close ended questions were used to support the qualitative data needed in the analysis of the gathered quantitative data gathered.

Data Gathering

In the primary survey technique the researcher conducted direct observation by visiting the target barangays for 4 times to establish rapport with the commercial drinking water suppliers and some of the respondents. Data gathering was done from April 2018 to August 2018.

Moreover, in order to facilitate and obtain the relevant data, other data collection methods were done.

Review of Secondary data.

Key informant approach. This approach was done during the preliminary investigation and during the data collection method. Questionnaire distribution was done simultaneously to minimize time and effort

Among the key informants are the following:

1. Barangay officials;
2. Barangay teachers who reside in the area;
3. City Planning Officer
4. Department of Health Tabuk City ;
5. Department of Health Kalinga
6. Other line agencies like, Department of Trade and Industry and Department of Environment and Natural Resources.

Survey Method. The use of structured and questionnaire were used. They were delivered personally and the aid of 4 enumerators. During the collection of questionnaires, supplementary interviews with the respondents was done to ascertain and clear up some information gaps.

Direct observation. This technique used actual observation of product distribution and consumption.

Triangulation. This technique was used to facilitate validation of data through cross verification from two or more sources like households and suppliers.

Data Analysis

Data were analyzed using the descriptive and inferential statistics. Methods used is based on the data and the hypothesis tested. Percentages, means and ranking and ranges were used to describe the socio-economic characteristics of the respondents. The Likert Scale was used in capturing the opinions of respondents.

Pearson- Moment Correlation Coefficient (r) was used to determine the relationship between the dependent and independent variable. Multiple regression Analysis was used to determine the degree of contribution and variation between each two variables. Analysis of Variance was used to determine the demand and consumption pattern of commercial drinking water as affected by the motivational factors. The SPSS was used to obtain correlation and regression values.

III. RESULTS AND DISCUSSIONS

Table 1. Socio-economic profile of respondents. * n=537

A. Socio-economic profile			
Educational attainment			
Elementary	1	10	1.86%
High School	2	16	2.98%
College graduate-	3	511	95.16%

Total	537	
Household size		
1-3 1	11	2.05%
4-6 2	509	94.79%
6-7 3	17	3.17%
Total	537	
Income		
below250, 000 1	26	4.84%
Above 250,000-500,000 2	348	64.80%
Above 500,000- 1,000,000 3	105	19.55%
Above 1,000,000 4	58	10.80%
Total	537	
Occupation (PSOC, 2012)		
1. Managers	71	13.22%
2. Professionals	287	53.45%
3. Technicians	18	3.35%
4. Clerical jobs	20	3.72%
5. Service and sale workers	35	6.52%
6. Skilled Agriculture, forestry &fisher producers	63	11.73%
7. Craft related trades workers	9	1.68%
8. Plant machines operators	3	0.56%
9. Elementary Occupations	16	2.98%
10. Military	15	2.79%
Total	537	
B. Home Physical Environment		
Sewerage system	537	100%
Toilet facilities	537	100%
Solid waste management (scheduled garbage Collection)	514	96%
c. Source of drinking water		
Tap water	23	4.28%
Commercial Drinking Water	514	96%
Total	537	
D. Drinking water Storage practices		
Earthen jars	10	1.86%
Aluminium containers	0	
Plastic Containers (jugs)	527	98.14%
Total	537	

*Multiple Response

Table 1 shows the socio-demographic characteristics of the respondent households in Dagupan, Dagupan Centro, Bulanao, and Bulanao Norte as to educational attainment, household size. Level of income and occupation, home physical environment, source of drinking water and home environment. As reflected on the table, majority (95.0% of the respondents were College graduates so most of them are professional with high income that can support of 4-6 members of the household. This findings confirm the study of Rauf, S. Et al. (2015) that households are willing to pay for an improved water supply system provided by the public sector, and a willingness to pay is significantly determined by awareness, levels of education, social capital, and household income. Educated respondents have access to information regarding quality drinking water and such individuals are more concerned about the health impacts of using water derived from a hand pump or tap water. So education has a significant impact on a household's likelihood of drinking quality water, i.e. bottled water.

Table 2 further reveals that majority (100%) of the respondents have good home environment as accounted by the presence of sewerage system(100%) which is currently widened , toilet facilities was found to be for improvement

to abate fecal contamination especially households of Dagupan area and Bulanao area that are adjacent to schools, hotels and eateries while solid management practices(96%) it's quite good due to the scheduled garbage collection and implementation of Solid Waste Management Act which coincides WHO (2017) statements that climate change caused changing water temperature and rainfall patterns, severe and prolonged drought or increased flooding, its implications for water quality and water scarcity, and recognizing the importance of managing these impacts as part of water management strategies . Tabuk City has private drinking water sources like Tabuk Water Corporation that produces more than 100 liters per second that can sustain enough treated water to the identified Barangays that that are populated wherein majority (96%) of the respondents had been connected, in spite of the services of Tabuk Water there were 23 (4%) respondents who still consumed tap water from dug wells due to the distance of these residents from the service connection drop. It was found out that majority (98 %) of the respondent's stored drinking water in plastic containers from a refilling station.

Table 2. Accessibility of Commercial drinking water.

Indicators	Frequency	Percentage
Very accessible(good price, available source, less than 3 km market distance)	537	98.88 %
Accessible(good price, available source, more than 3 km market distance)	6	1.12 %
Less accessible(good price, available source, more than 10 km market distance)	0	0
Total	537	100 %

As indicated in Table 2 majority (98.88%) of the respondents are very accessible with the source of commercial drinking water including affordable price at P25.00 per gallon which is less than 3 kilometres from the established refilling stations. Tabuk city report files (2015) further described that the connections of treated water

supply of the residents are classified as Level 111. Residents further stated that after strong typhoons or storms wherein there no electricity, the residents used tap water from the protected dugwells or from the refilling stations. Some respondents have their own personal filtration facility tapped at the water works connection.

*Table 3. Consumption pattern of commercial drinking water among the respondents.**

Indicator	frequency	rank
1.Time pattern		
1. Every hour	426	3

2. 2-3 hr interval	329	5
3. 4-6 interval		
4. 8-10 hrs interval starting at 0600 hour		
5. After food intake (meals and snacks)	504	2
6. Drink Water anytime based on weather	537	1
2. Place of Consumption		
2.1 Home	537	1
2.2. work	397	4
2.3.Other location	261	6

*Multiple response

Table 3 presents the consumption pattern of the respondents based on time of use and place. It was found out that majority of the household respondents consume commercial drinking water after food intake that includes meals and snacks either at home or at work and frequency of use was based on weather conditions. According to the

respondents higher water intake was observed during hot/warm conditions to normalize body temperature. Other locations that were identified by the respondents who are mostly professionals are when they are on travel, hospitals, and restaurants and during leisure time commercial bottled water is a part of their baggage for health reasons.

Table 4. Motivational factors associated with the commercial drinking water.

Indicators	Frequency	RANK
1. Social desirability (status symbol)	301	6
2. Price variation	412	5
3. Portability of container	124	9
4. Demographics of Household (include educational attainment , level of income , household size, occupation	537	1
5. Health security reasons	502	2
6. Market availability	537	1
7. Attributes of water (color, taste ,transparency, odor)	139	8
8. Climatic conditions	102	10
9. Advertisement motivation	438	3
10. Personal knowledge	98	11
11. Sewerage system conditions	278	7
12. Declining community hygiene	336	4

*Multiple response

Table 4 shows the ranked multiple responses extracted from the respondents regarding the motivational factors that affected their demand and consumption pattern of consumption of commercial drinking water, it is interesting to note that high level of responses is on market availability ranked number 1 (100 %) which implies that respondents are accessible to the source of commercial drinking water which is less than 3 kilometres as reflected from previous tables. This finding is supported by DOH Kalinga(2018) that as of November 2018 they have total of 40 recorded registered refilling stations of commercial drinking water sporadically established among the almost 10 barangays out of 42. It is further noted that 26 refilling stations were duly registered in the identified barangays as reflected in table 1 where Bulanao has 16 refilling stations found out serving 2,886 households. This finding also accounts the findings of Iftikhar Ahmad (2010) that the magnitude of willing to Pay (WTP) and demand of households on improved water quality because of its availability.

The table 4 further reveals that the demand and consumption pattern of respondents were due to health security reasons being the second rank . This finding is supported by the report of the Department of health Cordillera Administrative Region (2017) that there were recorded cases of diarrhea and typhoid fever which are water-related diseases. The disease incidence record encouraged the DOH Kalinga and DOH Tabuk City the strict implementation of the guidelines of Philippine Standard for Drinking Water (PNSDW , 2017)as a result of a DOH directive (Administrative Order No. 2017-0010)

seeking to update the existing standards of drinking water. Its objective is to address a number of new health issues and concerns. Based on interview of the Provincial Sanitary Engineer quarterly monitoring program is being conducted to monitor the commercial drinking water outlets to ensure safety of the consumers. Similarly, Kwak (2013) stated that water is an indispensable input for industrial production and human existence. Currently, people are increasingly concerned about their health, and their interest in the safety of drinking water has increased, hence there is a need to impose water quality management. Kwak et al(2013) described the economic benefits of tap water supply services in some urban areas of Korea, they cited that the economic benefit of water consumed is the sum of the actual water price and the additional willingness to pay (WTP) for the consumption. Their information can be beneficially utilized in conducting an economic feasibility study for a new project related to tap water supply service.

Based on the obtained ranks, third in rank that motivated the demand and consumption commercial drinking water is on advertisement motivation where information is typically from the mass media like television commercials, brochures, pamphlets and flyers. The finding of this study confirms the statements of Macclinis (2009) ; Sindhya (2013) that advertisement of a product as part of marketing strategy motivated consumers because effective advertising clutter , captures and persuade consumers not only on affordable pricing , packaging or brand stability but also due the personality of models used in advertisements.

Table 5. Pearson –Product Moment Correlation Coefficients of Demand and Consumption and motivational Factors

Variable	r	t- value
1.Educational Attainment	.2548	2.675**
2.House Hold size	.1392	1.016*
3.Level of Income	.2388	2.413**
4.Occupation	.1837	1.129*
5.Accessibility of commercial drinking water	.2548	2.675**
6.Social desirability	.1320	1.057*
7.Price variation	.0192	.1950*
8.Health security reasons	.1420	1.257*
9.Climate conditions	.1352	1.045*
10.Advertisement motivation	.1461	1.242*
11.Personal knowledge	.0671	.683 ^{ns}
12.Sewerage system	.0197	.200 ^{ns}
13.Community hygiene	.1302	1.012*

Table 6. Analysis of Variance for the considering the motivating factors of consumption and Demand and Consumption Pattern of Commercial Drinking Water .n=537

Source of variation	DF	Sum of squares	Mean squares	t-value
Regression	13	1197.679	92.129	2.092*
Error	524	4007.083	44.034	
Total	537	5204.762		

*significant at 0, 05 $R^2=73.01\%$

Table 6 shows the analysis of variance that gives an r-value of 2.092 which is significant at 0.05 level. This means that the variations in the demand and consumption of commercial drinking water is due to the above mentioned variables.

Table 7. Values of variables of the multiple regression model.

Variables	r	t- value
1.Educational Attainment	.2548	2.675**
2.House Hold size	.1392	1.016*
3.Level of Income	.2388	2.413*
4.Occupation	.1837	1.129*
5.Accessibility of commercial drinking water	.2548	2.675**
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11.Personal knowledge	.0671	.683 ^{ns}
12.Sewerage system	.0197	.200 ^{ns}
13.Community hygiene	.1302	1.012

ns- Not significant

*Significant

Table 7 shows the values of the multiple linear regression model, the estimated values of the parameters (intercept) $b_1 \dots b_{13}$ as shown on table 7. The demand and consumption after intercept value of 3.506 is far from zero. The 11 values are noticeably significant at 0.05 level.

The above result implies that the 11 variables directly affected the consumption pattern of commercial drinking water. This means that education, income, household size, occupation and accessibility of drinking water, Social desirability, price variation, health security reasons, climate conditions, advertisement and community

hygiene motivation has a great effect on the consumption pattern of the respondents. This findings of this study confirms the findings of Delina, P.Ja and Dasinaa (2016) that income is related with the consumption of commercial drinking water. Their willingness to pay water is not only because of high income but also due to household size, occupation. And accessibility of commercial drinking water source. Personal knowledge and Sewerage system found to be not significant because sewerage system is improving in Tabuk City and personal knowledge is low because most respondents do not have enough knowledge on the scientific testing and chemicals to be tested in drinking water.

Table 8. Sources of information about the issues on commercial drinking water. *n=537

Sources	Frequency	Percentage
1. Government pamphlet	40	7 %
2. Environmental science or any environment related class/seminar in college	65	12 %

3. Advertisement (TV, magazine, internet, etc.)	537	100 %
4. Parents/family members	423	79 %
5. Friends	283	53 %
6. Books/articles	22	4 %

*Multiple response

Table 8 presents the sources of information of commercial drinking water. Data show that advertisement (100%) from mass media has provided information about commercial drinking water. This implies that there was effective advertisement done by the bottled water companies in the promotion of their products. Data shows that parents and family members (79 %) are the sources of information because the households purchased branded commercial drinking water. With the more or less 15,000 student population of schools in Tabuk city demand for

commercial drinking water either from refilling station or portable bottled water in increasing. Friends and peers (53 %) was found to be a part of source information. It was found out that seminars (12%) were also a part of the source of information wherein filter business agents provide information about the quality of drinking water. Data shows further that there was an effort done by the government agencies like Philippine Information Agency, Department of Health and schools in their environmental science classes.

Table 9. Business practices employed by commercial drinking water suppliers and outlets. n=50

Indicators	Frequency	Percent
A. Marketing strategy		
a.1. Media advertisement (promotion mix)	50	100 %
a.2. consignment	15	30%
a.3. Arranged delivery schedule	50	100%
a.4. penetration pricing (lowering of price)	45	90 %
a.5. Market information (mass media, leaflets and brochures)	50	100 %
a.6. local penetration (retail stores & delivery	50	100 %
a.7. Outlet selection	40	80 %
B. Production Strategy		
b.1. Production process(training of workers)	50	100 %
b.2. Production technology (upgrading of facilities)	34	68%
b.3. Contract production	10	20 %
b.4. Transparent production process	50	100 %
b. 5. Quality control (vey quarter water test)	50	100 %

Table 9 shows the business strategies employed by the 50 commercial drinking water operators and outlets. Data shows that in marketing strategy a 100% responses along arranged delivery schedule, market information (mass media, leaflets and brochures), local penetration (retail stores & delivery) and Media advertisement (promotion mix) while this finding indicates that majority of the commercial drinking water had established relationship marketing or transactional marketing where the delivery is scheduled as

well as through advertisement their product has been known to the public. Semantic advertising that affected the mood of consumers while watching and listening to the language used. Local penetration through the delivery to retail stores. Penetration pricing was observed where prices differs. Outlet selection was done but low consignment (30%). Based on the interviews conducted to the commercial drinking water outlets like schools, hotels % restaurants, hospitals, cooperative stores. Refilling station stations

deliver within a radius of 1 kilometer depending on the volume of purchase.

In the production aspect the commercial drinking water operators, 100% responses were recorded along production process (training of workers), transparent production and Quality control (vey quarter water test). This implies that the commercial water they are producing are safe .Likewise , production technology (80%) that include cost of upgrading the facilities , according to the operators quarterly test and monitoring activities were undertaken by DOH Kalinga.

IV. CONCLUSION

Based on the findings conclusions are drawn:

Demand and consumption pattern of commercial drinking water is associated with time and place. Based on statistics the 11 motivational factors are significantly affected the demand consumption pattern of commercial drinking water namely; education , income, household size , occupation , accessibility of drinking water, social desirability ,price variation , health security reasons, climate conditions ,advertisement motivation and community hygiene.

It is further noted that information sources about the issues on commercial drinking water like advertisement from mass media, parents and family members, friends and peers and seminars were also a part of the source of information.

The growing population (6.2%) in study area concomitantly increase the demand and consumption of commercial drinking water so there is a high business opportunity.

The business sector has employed marketing and production strategies not only to attract buyers but also for public service.

V. RECOMMENDATIONS

Suppliers are encouraged to invest and expand commercial drinking water in Dagupan Centro and Bulanao Norte to cater the needs of the increasing household size per year. Commercial drinking water is suggested to be established also in other Barangays specially the areas that has no service connection of Tabuk Water Works. Consumers are encouraged to use commercial drinking water not only for health reasons but also in support to the local entrepreneurs. Commercial drinking water is suggested to be established also in other barangays specially the areas that has no service connection of Tabuk water

Works. The information can be beneficially utilized in conducting an economic feasibility study for a new project related to tap water supply service. Similar study shall be conducted that will focus on the awareness of the microbiological context of drinking water to control water-related diseases especially to the barangays not connected with public service water connections.

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